DOCUMENT RESUME

ED 255 197 IR 011 569

AUTHOR Blackburn, Katie
TITLE Issues in Education Resulting from the "Computer Revolution."
PUB DATE [83]
NOTE 13p.
PUB TYPE Viewpoints (120) -- Journal Articles (080)
JOURNAL CIT Centroid; v9 p15-18 Fall 1983

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Computer Graphics; *Computer Literacy; *Computer Software; Instructional Materials; *Microcomputers; *Problem Solving; *Teacher Education; Teachers
IDENTIFIERS *Computer Uses in Education

ABSTRACT

In order for microcomputers to be used in an efficient and effective manner in the classroom, the computer should not be used in trivial ways, such as utilizing it as an electronic ditto sheet or as a video textbook. Educators must take advantage of the computer's unique capabilities, including its branching capacity, its graphic mode, and its calculator mode. Microcomputers will afford two types of changes in the mathematics curriculum: computer literacy skills and problem-solving skills. While some excellent software has been developed, a large amount of software available is of poor quality. Selectivity is most important, and poor software must not be tolerated. If computers are to be well utilized in the classroom, teachers must be receptive, motivated, and competent in their use. Crucially, the misuses, misunderstandings, and misdirections by a teacher not well trained could destroy the validity of this technology. Methods feasible for training teachers include informal introductions, inservice, and professional study. (Author/LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Katie Blackburn

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED255197

Issues in Education Resulting from the "Computer Revolution"

By Katie Blackburn

Numerous issues concerning education have arisen as a result of the "computer revolution" that was brought by technological developments since the mid-1970's. The three most pressing issues, however, are

1. How can microcomputers be utilized in an efficient and effective manner?
2. What effect do microcomputers have on current curricula structure?
3. How can schools have effective implementation, retooling, and inservice?

As each of these issues is addressed, the intrinsic overlap of each to the other is well apparent, focusing further on the need for coherent direction of the whole--the computer revolution and its effects on education.

Efficient and Effective Usage in the Classroom

Many educational innovations and concepts have come and gone in the past three decades, and too often they have proved to be short-lived fads. There has been, in past times, what apparently was a rush to utilize the latest educational concepts or technologies only to find that there was little or any improvement in educational settings. For example,

IR011529

BEST COPY AVAILABLE

educational television and programmed texts are rarely seen in the classroom today, both of which once were in vogue.

Often these concepts or technologies were not helpful because of ineffective application in the classroom. School systems across the country seemed always to be jumping on the bandwagon to adopt the latest educational fad without a thoughtful analysis of possible effective and efficient uses. Too often, the new technique was used as a panacea or a guaranteed "cure all" for the ills of education. Disappointments were inevitable, and such educational innovations have "bitten the dust", abandoned for newer "improvements."

Educators now have the most powerful tool ever--the microcomputer. With the invention of the silicon chip in the mid-1970's, a whole new world of computers awakened, and the surge of the electronic revolution was upon us much like a tidal wave. As a result, the possible uses of the microcomputer in the classroom now almost boggle the mind.

It is important that most careful analyses and thoughtful considerations be given to the effective and efficient uses of the microcomputer in educational settings so that we do not see this powerful tool fall by the way. If the microcomputer becomes the "tail that wags the dog", there is a strong possibility that the microcomputer may have the same fate that other educational technologies have had. Inappropriate or ineffective use could result in yet another fad that is only to be stored in the already overcrowded closet.

How we use computers in the classroom could well mold the future of education. We, in education, should look at the unique capabilities which microcomputers provide but other media such as textbooks do not and take full advantage of those capabilities and not focus on "trivial" uses. Otherwise, the full power of the microcomputer lies dormant.

Three of the more powerful, unique features of the microcomputer are its branching capability, its graphics mode, and its calculator mode. All can contribute in dynamic ways to learning within the classroom.

The branching capability of the computer is perhaps the most valuable of all of its features, particularly in the area of problem solving and individualization. For example, a student might request clues or additional information such as a formula or even an algorithm which may not have been learned yet or which may have been forgotten. The branching capabilities of the computer could allow the student to select a chosen path to a solution while requesting more information which could be useful in solving the problem. Thus, individualization of problem solving could be enhanced in ways not possible heretofore in the mathematics classroom.

The branching capacity's contribution to problem solving could be expanded to provide the schools with valuable information so that there is a matching between teaching and learning styles. For example, a record of the types of paths followed by each particular student in the solving of problems and

the information that he requests could be analyzed. Hence, schools could have access to information about an individual student's problem solving procedures, and that individual could then be placed with a teacher whose method of instruction best suits the student's method of learning.

Another unique and powerful capability of the computer is the graphics mode. Often the complexity of a figure acts as a detractor and actually limits or prevents a student from finding a solution to a problem. Or, a student may not have the capability to draw an appropriate figure related to a problem. Excellent color diagrams related to problems may be presented by the computer in ways superior to textbook presentations. To actually see the effect of multiplying a variable in an equation by a variety of constants can give far more insight to the developing student than his reading in a textbook what those effects will be. To be able to plot three dimensional curves and view them rather than rely upon the imagination as to what they look like is a most attractive feature.

Motion, on the microcomputer, can be simulated in ways not previously possible with other types of media such as overhead transparencies or textbooks. To see the growth curve of a population under certain conditions or to see geometric transformations actually occur are exhilarating experiences, both for teacher and pupil alike. Figures, viewed as they are generated, can make their complexity easier to comprehend and less defeating.

The calculator mode is the third unique capacity of the computer. The calculator mode can contribute significantly to

the problem solving process. Students can solve many problems well beyond their computational abilities, or they may solve problems that - if they were done by hand - would be too time consuming to be feasible. Perhaps most important is that "real life" applications may be presented instead of conjured-up problems that "come out exact" which are included in textbooks in order to avoid the tedious calculations involved. These problems may be presented at relatively low levels of instruction.

Thus, the microcomputer's branching capability, graphics mode, and calculator mode are three very powerful capabilities that may be used in the classroom in ways which can greatly enhance students' problem solving and learning. Trivial uses of the computer such as ~~that of~~ using it as an electronic ditto sheet or as a video textbook are inappropriate and do not take full advantage of the computer's potential to truly augment the educational process in a significant way.

Effect on Current Curricula Structure

Educational practices may drastically change as a result of the computer. This impact is frightening, for all too often decisions involving the use of computers in educational settings are not being made in a thoughtful and careful manner. Before effective decisions can be made, appropriate curriculum goals must be determined.

It seems that there will be two types of changes in the mathematics curriculum. One change involves the preparation

of students to live and function in a computerized society. The other change is that computers offer such a great potential in problem solving, and their use as tools for problem solving is creating a restructuring of priorities in the field of mathematics education. Recognizing this fact, the NCTM has called for problem solving to be the top priority in mathematics education.

Mathematics curricula then will include computer-literacy skills and problem solving skills. Relating directly to curricular considerations are software considerations. The problems of teaching problem solving might be somewhat resolved through the utilization of the computer, for the computer has the power to present simulations that can promote high-level thinking and problem solving skills. Software to provide this type of instruction is an important demand in the curriculum development of the 1980's.

However, it seems that already there are too many programs available from a wide variety of sources. All too often, programs are not exclusively designed for use in the classroom but are merely modifications of existing programs already in use in business and other places. Teachers may, as often as not, have to rewrite usable instructions for their students. Furthermore, teachers might, in order to use the programs, have to create a curriculum to incorporate the specific programs.

The truth of the matter is that there are not enough quality programs available for the unique requirements of

education. There are a large number of educational programs being produced by people who are not educators and who know little of classroom management problems, learning theory or instructional design. Though certainly some excellent programs are available, what seems appropriate is that a clearing house be created in which educational programs are reviewed and rated by skilled educators who are knowledgeable of the unique capabilities that the computer can provide. Those involved in education must determine what learners and teachers can do with computers that is different or better than traditional methods and then either purchase or create software that capitalizes on those unique features. Selectivity then is important, and teachers must demand quality software. Strategies must evolve to protect the educational community from poor software. Poor software must not be tolerated, for putting bad curriculum on a computer does not make that curriculum any better.

Implementation, Retooling, and Inservice

If computers are to be used effectively in the classroom, it is essential that the teacher be competent to operate the computer and have a working knowledge and appreciation of how it may be used as a learning tool. Additionally, the teacher must be cognizant of how it can be integrated into the curriculum. A key factor in insuring successful computer implementation is that imaginative and energetic teachers use them well. This poses difficult problems in terms of teacher training

and inservice. Teacher training is critical, yet education does not enjoy the abundant funding for inservice and teacher training as it did during the heyday of the new mathematics. In the age of teacher burnout, lip-service competency, and apathy, it is often difficult to generate enthusiasm among teachers and to promote teacher acceptance.

In an effort to well utilize the microcomputer, it is essential that teachers are themselves receptive, motivated, and competent in its use. Crucially, the misuses, misdirection, and misunderstanding by a teacher not trained, could destroy the enormous validity of this technology in the classroom.

To lay the proper foundation, care in implementation with the teacher is essential. To force teachers to utilize a computer in the classroom when they are not competently trained or when they have negative attitudes toward the computer can be self-defeating. Methods feasible would be 1) informal introduction 2) inservice training 3) professional study.

The informal aspect would include placing a computer in a place easily accessible by teachers, such as the teachers' lounge or workroom. Simple instructions, written in a non-technical manner, should be posted nearby. Teachers should be encouraged to check out the machine overnight or on weekends and take it home to practice without risk of embarrassment. In addition, several programs of excellent quality should be provided for the teacher to review. As teachers' confidence and interest begin to build, experienced teachers who have

used the computers could be invited to demonstrate some of the applications of the computer for the classroom during planning periods or in after school sessions.

After this limited exposure, the computer could be placed in a classroom with a teacher who has already had experience using the computer. Demonstrations could then be given, allowing the students to have hands-on activities. It might be feasible to have a liaison person available in the school to aid in the usage of the computer. This person should have a good knowledge of how the computer works and also be trained in sound educational practices. This liaison must be able to communicate with teachers in a non-technical way and provide a great deal of reassurance to the teachers and the students.

After the informal training sessions, formal sessions should be presented with in-service credit awarded. In the formal training sessions, outside resources should be readily available such as teachers who have used the computers successfully in their own classrooms, college professors proficient in computer usage in educational situations, and representatives from various computer companies. Possible sessions could include such topics as classroom management problems and the computer, software evaluation, incorporating the computer into the curriculum, and developing software for specific classroom needs.

Finally, as a means of professional growth and motivation,

schools should promote the idea that teachers should attend at local colleges or universities those classes designed to further enhance their knowledge of c mputers and how to utilize them in the classroom Perhaps schools could even provide a substitute teacher or an extra planning period for a teacher during the duration of the courses so that it would be possible for the teacher to take the courses during school time if at all feasible.

The teacher training is primary, for without proper training, expertise, and enthusiasm, teachers will be directionless in attitude, goals, and productivity, and the success rate of the computers as educational tools will be minimal. Teachers should not be allowed to use computers in the classrooms until they are proficient and knowledgeable of how they may be used effectively.

Thus, we as educators are faced with a variety of issues as a result of the microcomputer revolution which has come about within the last decade. Three vital issues which must be dealt with thoughtfully and carefully are how the computers can be used in the best ways possible in education, what curricular considerations must be taken into account, and how schools can provide the necessary training for teachers. To keep the "revolution" on the road of valid applications away from closeted failures, these issues must be considered.

Bibliography

Anderson, Ronald E., Daniel L. Klassen, and David C. Johnson. "In Defense of a Comprehensive View of Computer Literacy-- A Reply to Luehrmann." Mathematics Teacher 74(December 1981): 691-694.

Andreoli, T. F. "The Effects of a Programmed Course in Computer Programming with Different Feedback Procedures on Mathematical Reasoning Ability." Ph.D. dissertation, University of Connecticut, 1976.

Baltz, B.L. "Computer Graphics as an Aid to Teaching Mathematics." Ph.D. dissertation, Ohio State University, 1977.

Bell, Frederick H. "Can Computers Really Improve School Mathematics?" Mathematics Teacher 71(May 1978): 428-433.

Carpenter, Thomas P., et al. "The Current Status of Computer Literacy: NAEP Results for Secondary Students." Mathematics Teacher 73(December 1980):669-672.

Coburn, Peter, et al. The Practical Guide to Computers in Education. Reading, Mass.: Addison Wesley Publishing Co., 1982.

Davis, Robert B. "Response." In Mathematics Education Research: Implications for the 80's. edited by Elizabeth Fennema. Alexandria, Va.: Association for Supervision and Curriculum Development, 1981. Pp. 149-153.

DeVault, M. Vere. "Computers." In Mathematics Education Research: Implications for the 80's.edited by Elizabeth Fennema. Alexandria, Va.: Association for Supervision and Curriculum Development, 1981. Pp. 131-149.

Doerr, Christine. Microcomputers and the 3R's A Guide for Teachers. Rochelle Park, N.J.: Hayden Book Company, 1979.

Gawronski, J.D. "Computers in School Mathematics." In Education in the 80's: Mathematics, edited by Shirley Hill. Washington, D.C.: National Education Association, 1982. Pp. 88-93.

Gawronski, Jane D. "Computer Literacy and School Mathematics." Mathematics Teacher 74(November 1981): 613-614.

Gesshel-Green, Herb. "Getting Started in a High School: A Case Study." Mathematics Teacher 74(November 1981): 610-612.

Greenes, Carole. "The Computer in Mathematics Education." Mathematics Teacher 74 (November 1981): 588-589.

BEST COPY AVAILABLE

Hatfield, Larry L. "A Case and Techniques for Computers: Using Computers in Middle School Mathematics." Arithmetic Teacher 26(February 1979): 53-55.

Inman, Don and Donald Clyde. "Computer Applications." Mathematics Teacher 74(November 1981): 618-620.

Johnson, David C., et al. "Computer Literacy--What Is It?" Mathematics Teacher 73(February 1980): 91-95.

Kansky, Bob, William Heck, and Jerry Johnson. "Getting Hard-Nosed About Software: Guidelines for Evaluating Computerized Instructional Materials." Mathematics Teacher 74 (November 1981): 600-604.

National Council of Teachers of Mathematics. An Agenda for Action: Recommendations for School Mathematics of the 1980's. Reston, Va.: The Council, 1980.

National Council of Teachers of Mathematics. Overview and Analysis of School Mathematics Grades K-12. Reston, Va.: The Council, 1975.

Norris, Donald O. "Let's Put Computers into the Mathematics Curriculum." Mathematics Teacher 75(January 1981): 24-26.

Price, Camille C. "Microcomputers in the Classroom." Mathematics Teacher 71(May 1978): 425-427.

Robbins, Bill and Ross Taylor. "Getting Started in a Junior High School: A Case Study." Mathematics Teacher 74 (November 1981): 605-608.

Roberts, Nancy. "Introducing Computer Simulation into the High School: An Applied Mathematics Curriculum." Mathematics Teacher 74 (November 1981): 647-652.

Rubillo, James M. "A Sign of Strength: Admitting a Weakness." Arithmetic Teacher 29(October 1981): 2.

Saunders, James. "What Are the Real Problems Involved in Getting Computers into the High School?" Mathematics Teacher 71(May 1978): 443-447.

Taylor, Ross. "Computers and Calculators in the Mathematics Classroom." In Selected Issues in Mathematics Education. edited by Mary Montgomery Lindquist. Chicago: National Society for the Study of Education, 1980. Pp. 132-158.

BEST COPY AVAILABLE